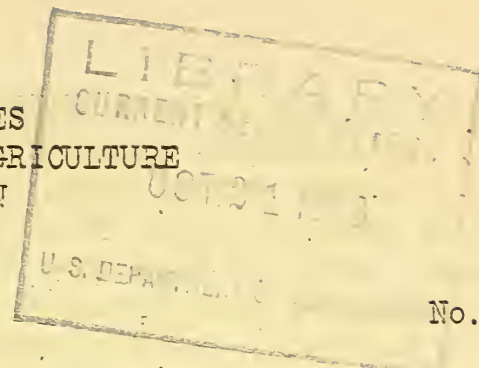


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SUBJECT: Comparison of Corn and Hog Situation in World Wars I and II.

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CORN AND HOGS IN WORLD WARS I AND II

SUMMARY

Production of corn, America's most important feed grain, and of hogs, the fastest common medium for converting grain into meat, increased markedly during each of the two World Wars. Corn acreage was considerably greater in World War I than it has been thus far in World War II. Yields per acre, however, have been consistently higher during the present war than they were 25 years ago, and so has total production. In fact, during 1942 both yield per acre and total production were the highest in history, with the result that this country produced nearly 267 million more bushels of corn on 21.4 million fewer acres than during the corresponding World War I year of 1917. Production during 1943, as indicated by the September Crop Report, promises to exceed that of the corresponding World War I year of 1918 by 544 million bushels with 7.9 million fewer acres.

To a considerable extent, the higher yields of the World War II years are attributable to cropping practices which have been adopted or extended under the Agricultural Conservation Program in recent years. The effects of four such practices -- use of fertilizer, use of lime, preceding corn by hay in the rotation, and substitution of hybrid for open-pollinated seed in the Corn Belt -- have been measured. Taken together, they are credited with 6.2 of the 28.4 bushels an acre which was the average corn yield in 1940. All of these practices except use of hybrid seed are conservation practices.

Hog production has likewise increased during both World Wars. Partly because a favorable hog-corn ratio has existed throughout the present war, swine production has reached a new all-time peak since Pearl Harbor. During 1942, the hog-corn ratio averaged 16.5 on the basis of prices received by farmers in the country as a whole, and 16.4 on the basis of wholesale prices at Chicago. The Chicago hog-corn ratio averaged 13.8 during September, 1943. By contrast, the Chicago hog-corn price ratio was down to 7.6 during July 1917, and remained below World War II levels throughout the war.

Prices, both of corn and hogs, were higher 25 years ago than they have been thus far in the present war. The average price of No. 3 Yellow corn at

Chicago was 166 cents a bushel in 1917, the all-time high, and was 161 cents in 1918. By contrast, the average price of No. 3 Yellow corn at Chicago was 83.3 cents a bushel during 1942, and in September, 1943, it had held steady at the ceiling price of 106.5 cents a bushel on that market for some months. The Chicago price of hogs rose to \$17 a hundredweight late in 1917, after the Food Administration had announced its intention to maintain a floor of \$15.50 insofar as possible, and the monthly average was \$19.65 during September and \$17.70 during October, 1918. By comparison, the Chicago price of hogs averaged \$13.70 during 1942, and \$14.33 during the week ended September 4, 1943.

The basic problem of maintaining a balance between corn and hog production in the present war is diametrically opposite to that of 25 years ago. Then the high price of corn relative to the price of hogs caused the Government to engage in strenuous efforts to persuade farmers to feed more of their corn for marketing in the form of pork and other hog products. Today, the high price of hogs relative to the price of corn has caused shortages of corn for feed to other livestock and for processing, to rectify which the Government has been forced to engage in equally strenuous efforts to persuade farmers to market hogs at lower weights and otherwise cut down on the quantity of corn used for feeding swine, and to put more of their corn on the market to supply the processors and the deficit feed areas.

WORLD WAR I

Corn in the World War I years, 1917-1918, as today, was the most important feed crop of the United States. Then, as now, it was used primarily as feed for livestock, predominantly hogs. More corn, however, was used for direct human consumption during World War I than has been used thus far during World War II, owing to the extreme scarcity of wheat during 1917 and 1918.

In 1917, the year the United States entered World War I, American farmers harvested 110,893,000 acres of corn. This acreage, the largest on record, was accounted for in large part by severe winter-killing of winter wheat during the winter of 1916-17. A great deal of land where wheat had failed was planted to corn. The average yield was 26.2 bushels an acre, and production totalled 2,908,242,000 bushels. This was one of the largest production on record. However, owing to early frosts, there was an unusually large proportion of soft corn. Partly because this resulted in a scarcity of corn suitable for seed, corn acreage dropped to 102,195,000 acres in 1918. The average yield also fell off to 23.9 bushels an acre, with the result that production declined to 2,441,249,000 bushels.

Using the conversion factor of 56 pounds to the bushel, it appears that 1917 production totalled 81,431,000 tons, /1 and 1918 production, 68,355,000 tons. The quantity of corn fed to hogs was 22,360,000 tons in 1917 and 26,361,000 tons in 1918. Corresponding figures on the total quantity of corn fed to all livestock are 63,214,000 tons in 1917 and 68,455 tons in 1918. /2 Translated

/1 Benjamin H. Hibbard, in "Effects of the Great War upon Agriculture in the United States and Great Britain" (New York, 1919) expresses the opinion that the conversion factor is too high, as applied to the 1917 crop, owing to its poor quality.

/2 R. D. Jennings in "Feed Consumption by Livestock, 1910-1941", USDA Circular No. 670, Washington, 1943.

into bushels, 2,257,643,000 bushels were fed to livestock in 1917 and 2,444,821,000 bushels in 1918.

Prices of corn during 1917 and 1918 rose to record heights. During 1917, the average price received by farmers was 116.6 cents a bushel, the highest ever attained up to that time, and during 1918, the average farm price reached the all-time high of 152.2 cents. The average price of corn at Chicago was \$1.11 a bushel during the year beginning November, 1916; \$1.63 during the year beginning November, 1917, which carried virtually to the Armistice, and \$1.62 during the year beginning November, 1918. These were levels that have never been attained before or since that time.

The high price of corn, compared with the price of hogs, which prevailed when the United States entered the war caused concern both to the Department of Agriculture and to the United States Food Administration. The Chicago hog-corn price ratio stood at 7.6 in July, 1917, /3 the lowest point that it had reached in several months. After a series of conferences, the Food Administration, on November 3, 1917, announced that it would endeavor to maintain hog-corn ratio, on hogs farrowed in the spring of 1918, of 13 to 1. This ratio is expressed as the number of bushels of corn it takes to equal in value 100 pounds of hog. It is determined, for any given time, by dividing the price of hogs by the price of corn. At the same time, it was announced that the price of hogs, so far as the Food Administration could affect them, should not go below \$15.50 per hundred-weight for the average of packers droves on the Chicago market until further notice. /4

After the Food Administration's announcement, hog prices advanced, averaging about \$17.00 at Chicago during the winter and spring of 1918. Partly because of the improvement of price, and partly because of energetic efforts of the Department of Agriculture to encourage pork production, the number of hogs, including pigs, on American farms increased from 57,578,000 on January 1, 1917, to 62,931,000 on January 1, 1918, and 64,326,000 on January 1, 1919.

The 13-to-1 ratio caused considerable confusion, and was eventually re-interpreted by the Food Administration. The market movement of the 1918 spring pig crop, as to which the ratio had been announced, was due to begin in September of that year. With the price of No. 3 Yellow corn in Chicago in August around \$1.72 a bushel, farmers would be entitled to a very high price for hogs. By basing the ratio on the average farm price of corn -- at one time use of the average cost of producing corn was considered -- a somewhat lower price was reached. It was decided that the farm price of corn in eight leading corn-and-hog-producing States should be used. The States named were Iowa, Illinois, Indiana, Ohio, Nebraska, Missouri, South Dakota, and Minnesota. The resulting price of hogs during October, 1918, excluding throw-backs, was finally set at \$18.00 per hundredweight. /5

/3. Frank M. Surface in "American Pork Production in the World War", Chicago, 1916, gives the hog-corn ratio in August, 1917, as 8.6. However he bases it on the farm price of corn and the Chicago price of hogs. Standard practice is to figure this ratio on the basis of either farm prices of both corn and hogs or Chicago (or some other market) prices of both.

/4. U.S. Food Administration, Meat Division, Prices of Hogs, statement by Joseph Cotton, November 3, 1917, Chicago, 1917. See also "Food Administration Experience with Hogs, 1917-19", by Walter T. Borg, in the Journal of Farm Economics, Volume XXV, Number 2, May, 1943.

/5 A spirited controversy developed over the price of hogs. This is not germane to the present report: those interested will find it discussed in Surface's book and Borg's article, already cited. While agreeing on facts, the two authors disagree on conclusions.

CORN TRENDS SINCE 1918

The 110,893,000 acres of corn harvested in 1917 set a high mark that has not been equalled either before or since. In 1919, 98,145,000 acres were harvested, and from that time through 1930, the harvested acreage ranged between 98 and 101 million acres. In 1931, acreage rose to nearly 107 million acres; in 1932, it reached 110,577,000 acres, the nearest that it has ever come to the 1917 record; and in 1933, declined to just under 106 million acres. From 1934 to the present time, corn acreage has at no time reached 100 million acres. Partly this has been owing to the acreage limitation programs in effect during the depression years, and partly to the rise to importance of soybeans. Soybeans are grown principally in the commercial corn area. In 1924, the total acreage of soybeans was 1,782,000 acres, of which 448,000 acres were harvested for beans, the rest being used as hay or forage. By 1941, acreage had increased so that the total acreage was 11,391,000, and the acreage harvested for beans was 5,881,000.

Since 1933 there have been two years of extremely low corn yields -- 1934, when the yield was at the all-time low of 15.7 bushels an acre, and 1936, when it was only slightly better at 16.2 bushels an acre. Those were years of extreme drought. In 1934, 1,448,920,000 bushels of corn were produced on 92,193,000 acres, and in 1936, 1,505,689,000 bushels were produced on 93,154,000 acres. Leaving those two years out of account, yields since the acreage reduction program was first put into effect under the Agricultural Adjustment Act of 1933 have been heavy; and since the Agricultural Conservation Program went into full effect in 1937, they have risen to heights never before attained, and seldom approached, since the Department of Agriculture began tabulating statistics in 1866.

Effects of Cropping Practices.

Four cropping practices that have been definitely measured, /6 together with a return of normal weather, are largely responsible for the extremely high yields of recent years. Three of these practices -- use of fertilizer, use of lime, and preceding corn by hay in the rotation -- are conservation practices; the fourth, use of hybrid seed in the Corn Belt, is not. All of these practices were stimulated by the farm programs that have been in effect in recent years.

Hybrid corn, which offers additional security against low yields and crop failure, is one of the outstanding farm developments of recent years. Seedmen estimate that its use increases the yield, under farm conditions, by from 15 to 20 percent. /7 It gives higher percentage increase in dry seasons than in normal seasons, and is thus something of an insurance against drought. /8 Hybrid seed corn was first produced commercially in Connecticut about 1922, and hybrids adapted to the Corn Belt became available about 1929. In 1933, there were about 40,000 acres of hybrid corn in the United States. By 1939, approximately 24 million acres were grown -- roughly one-fourth of the national corn acreage. This factor accounted in that year for 100 million bushels more corn than would have been produced if only open-pollinated varieties had been planted.

/6 Harold F. Breimyer in "An Analysis of Crop Yields in Relation to Production Goals for Agriculture", mimeographed, USDA, BAE, Washington, 1942.

/7 "Technology on the Farm", a special report by an Interbureau Committee and the BAE, USDA, Washington, August, 1942.

/8 Harold F. Breimyer, op. cit.

The weighted average of data from experiment stations indicates that corn yields are increased by 12.5 bushels an acre when hay precedes corn in the rotation. /8 Reduction of corn acreage under the original AAA program, and more especially the encouragement given to production of soil-building and soil-conserving crops under the Agricultural Conservation Program since 1936, have tended to increase the acreage of corn planted after hay. Breimyer, calculating the difference between corn and hay acreages in the four States of Ohio, Indiana, Illinois and Iowa, for each year, found that the smallest difference occurred in 1932. Taking this as zero, he computed the increase in corn planted after hay in those four States to be 500,000 acres in 1935, 1,200,000 acres in 1936, 3,000,000 acres in 1937, 12,093,000 acres in 1938, 20,371,000 acres in 1939, and 26,248,000 acres in 1940.

Based on averages of several hundred reports of Federal and State experiments, and corrected to average yields, the return per ton of fertilizer of average plant food content is estimated at 140 bushels of corn. Application of liming materials to acid soil likewise increases the yield of corn perceptibly. Use of both fertilizer and lime slumped greatly during the depression years, with fertilizer reaching its low in 1932 and liming materials in 1933. From 1934 on, and especially since 1936, use of fertilizer and lime increased greatly. Partly this increase was due to improved farm income; largely it was due to payments, often in the form of materials, made under the Agricultural Conservation Program. By 1940, use of fertilizer, lime, and improved rotations, and adoption of hybrid seed, had expanded so much that the effect on the national average corn yield was substantial. In that year, says Breimyer, fertilizer accounted for an average of 2.62 bushels an acre, when corrected for the favorable growing season; liming accounted for 0.6 bushels an acre, hay land in the rotation for 1.2 bushels, and hybrid seed for 1.7 bushels an acre, making a total of 6.2 bushels an acre attributable to the four practices. It should be noted that the yield credited to hay in the rotation refers to the effect of the increased acreage of corn planted after hay in 1940 as compared with 1932.

The three conservation practices mentioned are simple practices which any farmer can use without special equipment and without special training or instruction. During the past decade, other practices, such as contour cultivation, strip-cropping, and terracing have come into wider use, chiefly as a result of the activities of the Soil Conservation Service. Some of these practices produce immediate improvement in yields, but have not yet been adopted widely enough to be reflected significantly in national averages. Others do not make their influence felt immediately, although their long-range effects will be of considerable importance. Still others, of the simpler as well as of the more complicated practices are yet to be evaluated in specific, bushels-an-acre terms.

CORN AND HOGS IN WORLD WAR II

Price Behavior Between Wars

The price of corn, which had reached the all-time peak of 152.2 cents a bushel at the farm in 1918, stayed close to that level for about a year after

/8 Harold F. Breimyer, op. cit.

hostilities ended. The average farm price during 1919-20 was 151.3 cents. Then it declined sharply to an average of 61.8 cents in 1920-21 and 52.3 cents in 1921-22. From that time until Pearl Harbor, the price fluctuated widely from year to year. Only twice during the quarter-century between the wars did the annual average farm price reach a dollar a bushel - in 1924, when it was 106.1 cents, and in the drought year of 1936, when the average farm price was 104.4 cents. During 1931-32 and 1932-33 the average farm price of corn was 32.0 and 31.9 cents a bushel, respectively, the lowest figures since the average of 29.8 cents a bushel that was experienced in 1899.

At the start of the 1941-42 marketing year on October 1, 1941, the national supply of corn totalled 3,321 million bushels, of which 2,676 million bushels represented the new crop and 645 million bushels represented stocks on hand, including corn under loan in the Ever-Normal Granary and Government-owned corn. Immediately after Pearl Harbor, needs for the coming year were reappraised in view of the entrance of the United States into the war. In January, 1942, farmers were asked to plant between 92.5 and 95 million acres of corn. The lower limit of this goal was 4.9 million acres, or 6 percent, above the acreage planted in 1941. ¹⁹ It was anticipated, on the basis of normal yields, that this acreage would produce in the neighborhood of 2.6 billion bushels. As it turned out, the yield of 35.5 bushels an acre was the largest in history. Thus, although only 89,484,000 acres were harvested, production reached the record total of 3,175,154,000 bushels of corn. The 3-billion-bushel mark had previously been crossed only twice--in 1906, when 3,032,910,000 bushels of corn were harvested from 95,624,000 acres, and in 1920, when 3,070,604,000 bushels were produced on 101,359,000 acres.

A still greater increase in corn acreage was requested for 1943. The goal was set at 95 million acres, an increase of 4 percent over 1942. Before planting time, all acreage restrictions were lifted. Considerable corn land was flooded out in the spring of 1943. The October crop report indicated that 94,297,000 acres of corn will be harvested this fall, 5.4 percent more than the average harvested in 1942. With a yield of 32.4 bushels an acre indicated, total production promises to be 3,055,605,000 bushels. This would be somewhat less than last year's record production, but it would be substantially greater than production in 1918, the corresponding year of American participation in World War I.

As the war nears the start of its third year, with no indication that it will end before 1945 at the earliest, plans are being made for greater production in 1944. While the national corn goal for 1944 has not been definitely determined as this is written, indications are that it will be in the neighborhood of 100 million acres.

Soybeans Compete for Acreage

In comparing corn acreage during the present war with that during World War I, it is necessary to bear in mind several factors in the present situation that were absent 25 years ago. One is the increased yield per acre resulting

¹⁹ "Suggested State and Regional Distribution of Revised Goals and Expected Production for 1942," mimeo., USDA, Washington, January, 1942.

from the inter-war developments that have been already outlined. As a result, a smaller acreage is needed to produce a given quantity of corn than was the case in World War I.

A second, and highly important, factor in the current situation is the urgent need for soybeans for oil and meal. The rise of soybeans to the status of an important crop in the United States has occurred since the close of World War I. During the period 1930-39, an average of 2 million acres was harvested for beans. /11. This increased to 4.8 million acres in 1940, and to 5.9 million acres in 1941. In 1942, 10.8 million acres of soybeans were harvested for beans, /12, and in 1943, the September crop report indicates that 11.5 million acres will be harvested for beans. The national goal for soybeans harvested for oil in 1944 is likely to be in the neighborhood of 14 million acres.

Soybeans compete with corn for acreage, and the States which produce the greatest quantity of soybeans are also the states which lead in corn production.

Totaling the acreage of corn with that of soybeans harvested for beans, we get 100.2 million acres harvested in 1942, 105.8 million acres indicated for harvest in 1943, and a goal of around 114 million acres for 1944.

Hog Production Increases

American hog production began to increase in 1941, several months before Pearl Harbor, and has continued to increase until the present time. Pigs saved in the spring of 1941 totaled 49.2 millions, about the same as a year earlier. In the fall of 1941, the number of pigs saved was 35.5 million, an increase of 17 percent over the 30.3 million pigs saved from the fall farrow of 1940. The spring farrow of 1942 yielded 61 million pigs saved, 24 percent more than the previous year, and the 43.7 million pigs saved from the 1942 fall farrow represented an increase of 23 percent over the fall farrow of 1941. The spring farrow of 1943 produced 74 million pigs, about 22 percent larger than the 1942 spring pig crop, and a 1943 pig crop of about 53 million head was indicated in June by farmers' reports of sows bred or to be bred to farrow in the fall. Spring and fall pig crops combined would give a total of about 127 million head, compared with about 105 million head in 1942 and a 10-year average (1932-41) of 73,148,000. The number of hogs over 6 months old on farms on June 1, 1943, was estimated at 36,257,000 head, a number exceeding that of June 1, 1942, by 7,416,000 head or about 26 percent, and much the largest on record. /13.

Simultaneously with the increase in the number of swine in the United States, there occurred a marked increase in the weight at which hogs were marketed. Where the average weight of hogs received at Chicago had been 253 pounds in 1940, it increased to 259 pounds in 1941, and to 262 pounds in 1942. /14. Corresponding figures for seven markets /15. were 241 pounds in 1940, 248 pounds

/11. "Agricultural Statistics, 1942," USDA, Washington, 1942.

/12. "Agricultural Production Goals for 1943, with Comparisons," mimeo., USDA, Washington, February 5, 1943.

/13. These figures were taken from the Pig Crop Reports issued by AMS in June and December, 1941, and by BAE in June and December, 1942, and June, 1943.

/14. "Livestock, Meats and Wool Market Statistics and Related Data 1942," processed, FDA, Washington, 1942.

/15. Chicago, East St. Louis, Kansas City, Omaha, Sioux City, So. St. Joseph, and So. St. Paul.

in 1941, and 252 pounds in 1942. The trend toward marketing hogs at heavier weights has continued through August, 1943, with the average weight both at Chicago and at the seven markets running consistently higher than during the corresponding month of 1942. For instance, the August, 1943 figures were 301 pounds at Chicago and 286 pounds at the seven markets.

At the outset, the trend toward heavier weights was encouraged, and even urged, by the Department of Agriculture as one way of quickly increasing production of pork products, first for lend-lease and defense requirements, and, after Pearl Harbor, for American and Allied war needs. Recently, as a result of the unparalleled increased numbers of swine, together with a tightening feed situation, farmers have been asked to market hogs at lighter weights.

Trend of Prices During World War II

During the present war, the price of corn has not soared to any such fantastic heights as it reached a quarter of a century ago. The average price of No. 3 yellow corn at Chicago was 70.4 cents a bushel during 1941, and 83.3 cents a bushel during 1942. /16. In September, 1943, it had held steady at the ceiling price of 106.5 cents a bushel for some time.

The price of hogs, on the other hand, has increased considerably. During 1941, the average price was \$9.45 per 100 pounds at Chicago and \$9.38 was the 1941 average price at seven markets. During 1942, the first full year of American participation in the war, the average price of hogs at Chicago was \$13.70, the highest annual average on that market since 1920, when the figure was \$13.91. The 1942 average price of the seven markets was \$13.53. The average price paid at Chicago during the week ended September 4, 1943, was \$14.33, compared with an average of \$14.11 during the corresponding week of 1942.

The result of price trends during the present war has been a hog-corn ratio extremely favorable to production of hogs. The hog-corn ratio during 1941 averaged 14.2 based on prices received by farmers in the country as a whole and 13.4 based on wholesale price at Chicago. During 1942, the ratio averaged 16.5 based on prices received by farmers in the country as a whole, and 16.4 based on wholesale prices at Chicago. The Chicago hog-corn ratio was 13.8, based on all purchases during September, 1943, compared with 17.2 for the corresponding month of 1942.

/16. "Livestock Meats and Wool Market Statistics and Related Data 1942," processed, FDA, Washington, 1943. Each of these figures represent the simple average for the calendar year mentioned.

Table I

Comparison of Corn Acreage, Yield, and Production in corresponding years before and during World Wars I and II

	World War I Period	World War II Period
	1916	1941
Acreage (000 omitted)	100,561	86,186
Yield (bus. per acre)	24.1	31.0
Production (bus., 000 omitted)	2,425,206	2,675,790
	1917	1942 /1
Acreage (000 omitted)	110,893	89,484
Yield (bu. per acre)	26.2	35.5
Production (bushels, 000 omitted)	2,908,242	3,175,154
	1918	1943 /2
Acreage (000 omitted)	102,195	94,297
Yield (bu. per acre)	23.9	31.7
Production (bushels, 000 omitted)	2,441,249	2,985,267

/1. Preliminary, August, 1943, Crop Report.

/2. Indicated, September, 1943, Crop Report.

